



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/525,426	02/23/2005	Veronique Mathieu	13146-00002-US	5752
23416 7590 03/05/2009 CONNOLLY BOVE LODGE & HUTZ, LLP P O BOX 2207 WILMINGTON, DE 19899				
EXAMINER NGUYEN, NGOC YEN M				
ART UNIT 1793		PAPER NUMBER		
MAIL DATE 03/05/2009		DELIVERY MODE PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/525,426

**Applicant(s)**

MATHIEU ET AL

**Examiner**

Ngoc-Yen M. Nguyen

**Art Unit**

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on October 24, 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/ICE)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 01/17931 (using Braun et al 6,521,199 as unofficial English translation) or Braun '199, either one in view of Bisignani et al (3,320,030), optionally further in view of Noland et al (6,787,034).

WO '931 or Braun '199 discloses a process for regenerating spent onium fluoride-HF adduct (note claim 1 and abstract or Braun '199, claim 1).

A particular embodiment relates to regeneration for multi-step fluorination methods. For many multi-step fluorination methods, the conditions for the required reaction medium are different. This is the case for the production of sulfuryl fluoride from sulfuryl chloride, for example. It has been found that the second fluorination step, that of converting the sulfuryl chlorofluoride to sulfuryl fluoride, proceeds satisfactorily only if the sulfuryl chlorofluoride starting compound is obtained from an adduct of onium fluoride and HF in which the ratio of amine to hydrogen fluoride does not exceed 1:3.5. In contrast, the first step involving the fluorination of sulfuryl chloride to produce sulfuryl chlorofluoride is independent of the hydrogen fluoride content in the reaction medium.

For the production of sulfonyl fluoride, spent adduct is regenerated in first reactor using a large excess of HF while the sulfonyl chloride present in the reactor is simultaneously fluorinated to produce sulfonyl chloride fluoride. In this regard, it is not necessary to convert all the sulfonyl chloride. After regeneration, the hydrogen is distilled off to bring the amine to HF ratio to the desired value of less than 1:3.5. The reactor contents can either be further reacted to produce sulfonyl fluoride or transferred to another reactor to carry out the reaction (note paragraph bridging page 4-5 or Braun '199, column 3, lines 37-65).

WO '931 or Braun '199 clearly teaches that the sulfonyl chloride is converted first to sulfonyl chloride fluoride and then the sulfonyl chloride fluoride is converted to sulfonyl fluoride in a second step.

WO '931 or Braun '199 also discloses that the process can be carried out at a temperature range from -20 to 200°C (note claim 4 of WO '931 or claim 6 of Braun '199). The upper limit of 200°C is well within the claimed range of "at least 150°C".

In WO '931 or Braun '199, a two-step method is disclosed for producing sulfonyl fluoride. In the first step, sulfonyl chloride fluoride is produced and in the second step, sulfonyl chloride fluoride is converted to sulfonyl fluoride. This fairly suggests that only sulfonyl chloride fluoride is the desired reactant for the second step and one of ordinary skill in the art would optimize the amount of sulfonyl chloride fluoride in the reactants to obtain the desired product.

WO '931 or Braun '199 does not disclose the specific conditions for the process, such as temperature and pressure, etc. However, it would have been obvious to one of

Art Unit: 1793

ordinary skill in the art at the time the invention was made to optimize the process conditions through routine experimentation.

Since the starting material in WO '931 or Braun '199 is sulfuryl chloride, it should be substantially devoid of chlorine and hydrogen chloride as required in the instant claims. It should be HCl would be a by-product in the reaction between the sulfuryl chlorofluoride and HF, therefore, the presence of HCl in the reactants should be minimized to push the reaction toward making the products. WO '931 or Braun '199 also teaches that the easy expulsion of HCl gas is desirable (note WO '931, middle paragraph on page 4 or Braun '199, column 3, lines 3-5).

WO '931 or Braun '199 teaches that it is advantages to carry out the regeneration in an autoclave or pressurized vessel with the addition of HF at an elevated temperature ranging from 80 to 120°C, *for example* (note page 2, second full paragraph of WO '931 or paragraph bridging column 1-2 of Braun '199, emphasis added). It should be noted that the teaching of WO '931 or Braun '199 should not be limited to the exemplified temperature. Furthermore, since the process can be carried out under pressure, it would have been obvious to one skilled in the art to optimize the temperature and pressure in the process of to sufficiently form sulfuryl fluoride.

When the sulfuryl fluoride is produced by the two-step process as mentioned in the above rejection, it would have been obvious to one of ordinary skill in the art to optimize the temperature and pressure for each individual step in order to produce sulfuryl chloride fluoride in the first step and sulfuryl fluoride in the second step.

The difference is WO '931 or Braun '199 does not disclose the use of a catalyst.

Bisignani '030 discloses a process for producing sulfuryl fluoride and or sulfuryl chlorofluoride by reacting HF, chlorine and sulfur dioxide (note claim 1 and the chemical equation in column 1). Bisignani '030 teaches that the presence of a solid catalytic material comprising a major weight proportion of activated carbon can help promote the reaction (note claim 1). Bisignani '030 can be applied to teach that in order to minimize difficulties in the product recovery system, which might arise out of the presence of excess chlorine, an excess of chlorine over theory is not desirable (note column 3, lines 56-61). This fairly teaches that unless chlorine is required for the reaction, its presence in the product is not desired and one skilled in the art would optimize the process condition in order to minimize the presence of chlorine in the final product.

The activated carbon as disclosed in Bisignani '030 would inherently be a microporous material and has high surface area as the activated carbon used in the claimed invention. In any event, it would have been obvious to one of ordinary skill in the art to optimize the surface area of the activated carbon catalyst used in Bisignani '030 in order to obtain the best results.

Optionally, Noland '034 can be applied to teach that when activated carbon is used as a support for a catalyst, such activated carbon is preferred to have high surface area in the range of 800-1800 m<sup>2</sup>/g (note column 5, lines 11-13, 53-55).

Bisignani '030 can also be applied to teach the known and convention temperature range of 175-325°C for producing sulfuryl fluoride (note column 4, lines 8-15) and pressure range of 2-20 psig (note column 4, lines 58-62).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the process of WO '931 or Braun '199 in the presence of a catalyst as suggested by Bisignani '030 because such catalyst is known and conventional in the art to promote an analogous process.

Claims 1-7, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woole '626 in view of Bisignani '030.

Woole '626 discloses a process for the production of sulfuryl fluoride which comprises reacting a sulfuryl compound selected from the group consisting of sulfuryl fluoride, sulfuryl bromofluoride and sulfuryl chlorofluoride with ammonium bifluoride (note claim 1). The ammonium bifluoride as disclosed in Woole '626,  $\text{NH}_4\text{HF}_2$ , is considered as  $\text{NH}_4\text{F} \cdot \text{HF}$  or a HF-containing compound. The temperature for the process of Woole '626 is within the range of about  $30^\circ\text{C}$  to about  $220^\circ\text{C}$  for producing sulfuryl fluoride (note column 2, lines 16-18). The upper limit is well within the claimed range of "at least  $150^\circ\text{C}$ ".

For the amount of sulfuryl chlorofluoride in the precursors, since Woole '626 discloses sulfuryl chlorofluoride is a suitable reactant for producing sulfuryl fluoride, it would have been obvious to one of ordinary skill in the art to use solely sulfuryl chlorofluoride as the reactant.

For claims 6-7, note the reasons as stated above.

Woole '626 does not disclose the use of a catalyst.

Bisignani '030 is applied as stated above to teach the use of a catalyst to promote the production of sulfonyl fluoride.

Applicant's arguments filed October 24, 2007 have been fully considered but they are not persuasive.

Applicants argue that the temperature disclosed in claim 6 of Braun '199 is only for the regeneration in which sulfonyl chloride fluoride may be produced (same as Applicants' first step) while Applicants' claim 1 addresses the second step, the fluorination of sulfonyl chloride fluoride to form sulfonyl fluoride.

In WO '931 and Braun '199, the regeneration can be a multi-step process (note Braun '199, lines, 38-39). As clearly stated in claim 1, the regeneration process as disclosed in WO '931 or Braun '199 is to produce fluorine-containing compounds from chlorine-containing or bromine-containing compounds, thus, the regeneration would not just include the step of producing sulfonyl chloride fluoride as argued by Applicants because such compound still contains chloride and the process of WO '931 or Braun '199 is to produce fluorine-containing compounds from such chlorine containing compound.

Applicants argue that Braun does not mention to perform the second step in a gas-phase reaction.

Braun '199 clearly teaches the second fluorination step of converting sulfonyl chlorofluoride to sulfonyl fluoride, thus, it would have been obvious to one of ordinary



skill in the art to optimize the temperature, thereby the phase for the reaction, for this step in order to obtain the best results.

Applicants argue that Braun does not disclose the use of a microporous material comprising catalyst.

Bisignani '030 is applied as stated in the above rejection to teach the use of an activated carbon, i.e. a microporous material, as a catalyst. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants argue that Woole does not operate in a gas-phase reaction step because ammonium bifluoride has boiling point higher than the reaction temperature.

In Woole, the other reactant, e.g. sulfuryl chlorofluoride, is the same as the claimed  $\text{SO}_2\text{ClF}$ , thus, at high reaction temperature, e.g. about  $220^\circ\text{C}$ , such sulfuryl chlorofluoride in the process of Woole would inherently be in the gas phase as the  $\text{SO}_2\text{ClF}$  in the claimed process and the reaction of Woole is considered as a gas phase reaction because there is at least one reactant in gas phase. The "gas-phase" reaction does not require that all reactants must be in gas phase.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Definition of "activated carbon" from Hawley's Condensed Chemical Dictionary, 14th Edition Copyright ©2002 by John Wiley & Sons, Inc. is cited to show that activated carbon inherently has internal porous structure. (citing is taken on-line from [http://www.knovel.com/web/portal/basic\\_search/display?p\\_p\\_id=EXT\\_KNOVEL\\_DISPLAY&p\\_p\\_action=1&p\\_p\\_state=normal&p\\_p\\_mode=view&p\\_p\\_col\\_id=column-1&p\\_p\\_col\\_count=1&\\_EXT\\_KNOVEL\\_DISPLAY\\_struts\\_action=%2Fext%2Fknovel\\_display%2Fview](http://www.knovel.com/web/portal/basic_search/display?p_p_id=EXT_KNOVEL_DISPLAY&p_p_action=1&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_count=1&_EXT_KNOVEL_DISPLAY_struts_action=%2Fext%2Fknovel_display%2Fview)).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on a Part time schedule schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/  
Primary Examiner, Art Unit 1793

nmn  
March 5, 2009